7.09

STANDARD OPERATING PROCEDURES FOR THE COLLECTION AND PRESERVATION OF STREAM AND RIVER SAMPLES FOR CHEMICAL ANALYSIS USING THE DEPTH WIDTH INTEGRATED METHOD

Summary

Samples collected for chemical analysis should be representative of the entire stream or river. To be representative, samples must be carefully collected, properly preserved, and appropriately analyzed. A depth width integrated sample gives the most accurate representation of the entire stream concentration. The following procedure is modified from the USGS Field Guide for Collecting and Processing Stream-Water Samples for the National Water-Quality Assessment Program (Sheldon L. R. 1994 U.S. Geological Survey Open File Report 94-445).

The following description requires the use of either a hand held depth width integrated sampler like the DH-81, or a suspended depth integrated sampler like the DH-59. The hand held sampler should be used when the stream is safe to wade and the suspended sampler when flows are great enough to pose a safety hazard.

In practice the method of collecting a water quality sample using either the hand held or suspended sampler is the same. Five to 20 water samples are collected at equally spaced intervals across the stream and composited in a churn splitter. A general guide line is 5 samples for stream 5 feet wide or less and 10 for streams greater then 5 feet. On extremely wide shallow fast running streams 20 samples may be collected. A minimum spacing between sample points is 6 inches.

The sample is collected by lowering and raising the sampler the entire depth of the water column. Care is given to lower and raise the sampler at the same rate at each sampling point. The rate should be slow enough to get a half full bottle at the deepest area in the stream cross section but never so slow as to exceed 3/4 full bottle.

A good method for identifying the rate to lower and raise the sampler through the water column is to practice different rates at the deepest area in the stream cross section. The water collected during this process can be used to triple rinse the churn splitter.

The same rate of raising and lowering the sampler is used at all sample points. This will yield small sample volumes at the shallower and slower flowing sample points and greater volumes at the deeper and faster portions of the stream. The sample sizes at each point are flow proportional as long as the same rate of raising and lowering at each sample point is maintained.

Traverse the stream's cross section as many times as necessary to ensure collection of the volume of sample required for analysis. When additional sample points cannot be sampled

without overfilling the bottle (3/4 full), empty the bottle directly into the churn splitter or use another bottle and continue sampling until all sample points have been sampled. When more then one cross section is required to get enough sample, each sample point must be sampled an equal number of times so the composited samples will be proportional to the flow.

Equipment and Supplies

- Suspended depth integrating sampler (DH-59 TC or equivalent)
- Wading depth integrating sampler (DH-81 or equivalent)
- Churn splitter
- Acid for sample preservation (see Table 3.1)
- Sample labels.
- Cooler and ice or frozen gel packs.
- Deionized water for sample blanks and decontamination.
- Filter apparatus.
- For vacuum method.
    - Vacuum filter holder.
    - Vacuum pump.
    - 0.45 µm membrane filters (Millipore HAWP 047 00 or equivalent).
    - Pre-filters (Millipore AP40 0047 05 or equivalent).
    - Stainless steel forceps.
- For peristaltic method.
    - Power Drive (Compact Cat No. P-07533-50 or equivalent)
    - Peristaltic head (Easy Load II Cat No. P-77200-62 or equivalent).
    - In-line 0.45 µm cartridge filters (Geotech dispos-a-filter or equivalent).
    - In-line 5.0 µm cartridge pre-filters (Geotech dispos-a-filter or equivalent).
    - Tubing (Masterflex silicone Cat No. P-96400-24 or equivalent).
    - Churn Splitter.
- Field report form.
- Sample ID/Custody Record.
- Black ballpoint pen or mechanical pencil.
- Sample and blank log forms.
- Power ice auger (winter sampling).
- Ice skimmer (winter sampling).
- Sled (winter sampling).
- Stainless steel forceps.

Procedure

1. Identify number of sample points based on flow and stream depth.

2. Triple rinse churn splitter using stream water from deepest point in stream cross section.

3. Begin collecting sample by starting at the left or right edge of water. Raise and lower sampler through the water column at sample point 1.

4. Deposit sample portion into churn splitter when bottle approaches ½ to ¾ full.

5. Move to next sample point and repeat steps 3 through 4 until the entire cross section has been sampled.

6. After all samples have been composited, triple rinse each sample bottle with water from the churn splitter while gently stirring. Note: Do not break the surface of the water in the churn splitter.

7. Fill the sample bottle with water from the churn splitter while stirring gently:

8. Place a label on each sample container (Figure 7.09.3). Each sample container should be labeled accordingly with the appropriate analyte group as indicated in Table 3.1.

9. Place the samples in a cooler on ice.

10. Fill out the field report form (Figure 7.09.3), Sample ID/Custody Report (Figure 7.09.2) and the water chemistry sample log (Figure 7.09.1).

Field Bottle Blank Sample Collection

1. Field bottle blank samples are collected with first and every tenth stream sample collected (i.e., 1, 10, 20...). If the sample log indicates a blank should be collected, follow the steps below.

2. Triple rinse each sampling bottle using deionized water.

3. Fill each bottle with deionized water.

4. Preserve each sample appropriately. Note: Do not preserve the total dissolved phosphorus sample until after filtering.

5. Place a label on each sample container and fill out the sample information log form (Figure 7.09.3). Note: Field bottle blank samples should be identified with STORET number 389990. Be sure to indicate on the label the lake name, associated site identification number and the depth of the sample being duplicated.

6. Place the sample in a cooler on ice.

Duplicate Sample Collection

1. Duplicate samples are collected with the first and every following tenth stream sample collected (i.e., 1st, 10th, 20th...). If the sample log indicates a duplicate sample should be collected, follow the steps below.

2. Collect the sample following steps 1 - 7 under procedures.

3. Place a label on each sample container and fill out the Sample ID/Custody Report (Figure 7.09.2). Note: Duplicate samples should be identified with STORET number 389999. Be sure to indicate on the label the lake name, associated site identification number and the depth of the sample being duplicated.

4. Place the samples in a cooler on ice.

5. When a copy of the Sample ID/Custody Report is received from the DC, record the laboratory log number of the duplicate sample on the water chemistry sample log form.

6. Stream Sample Filtration: If one or more of the analyte groups require field filtering use these methods.

Field Sample Filtration Vacuum Method

1. Dissolved nutrient(s), dissolved mineral(s), and dissolved metal(s) must be filtered in the field immediately following sample collection.

2. Put on latex surgical gloves.

3. Remove filter holder from the plastic bag and assemble.

4. Rinse the filter apparatus three times with approximately 250 ml of deionized water each time.

5. Load a pre-filter in the filter apparatus and connect the vacuum pump.

6. Leach the filter twice with approximately 250 ml of deionized water each time.

7. Filter the sample through the pre-filter. Place the sample back into the sample container.

8. Remove the pre-filter from the filter apparatus and repeat Step 4.

9. Load a 0.45 µm filter into the filter apparatus and connect the vacuum pump.

10. Repeat Step 5.

11. Filter the sample through the 0.45 µm filter.

12. Triple rinse the sample container with deionized water.

13. Transfer the filtered sample back into the sample container.

14. Preserve nutrient sample with 2 ml 1/5 sulfuric acid and ICP metals and trace metals with 5 ml concentrated nitric acid lowering the pH to 2 or less.

15. Place the preserved sample in the cooler on ice.

16. If additional samples require filtration, repeat Steps 3 through 15.

Field Sample Filtration Peristaltic Method

1. Assemble and attach pump head to power drive.

2. Plug in power drive.

3. Put on latex surgical gloves.

4. Remove acid rinsed tubing from plastic bag, taking care to prevent contamination and place in head draping a long end into the churn splitter and dangling the short end out of contact with anything.

5. Turn on pump and begin rinsing tubing with a minimum of 250 ml of sample water from churn splitter.

6. As tubing rinses remove cartridge filter from plastic bag and insert cartridge while pump is still running to the tube's dangling end. Care should be taken to ensure filter cartridge is inserted in the correct direction.

7. Run 250 ml of sample water through cartridge filter.

8. Place labels on bottles.

9. Triple rinse the sample bottles and lids with sample water coming out of the filter cartridge.

10. Fill sample bottles.

11. Place labels on bottles.

12. Preserve nutrient sample with 2 ml 1/5 sulfuric acid and ICP metals and trace metals with 5 ml concentrated nitric acid lowering the pH to 2 or less.

13. Place samples in the cooler on ice.

14. If cartridge becomes plugged repeat Steps 6 through 15 with an in-line 2.0 µm pre-filter placed between the pump and the 0.45 µm filter.

North Dakota Department of Health
Division of Water Quality
Stream and River Field Log
Telephone: 701.328.5210
Fax: 701.328.5200

Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.
Sample #:		Site ID:	Site Description:	Date:___/___/____	Spec. Conduct	Temperature
Dup	Blk	Comments:		Time: :	pH	D.O.

Figure 7.09.1 Stream and River Field log.

For Laboratory Use Only Lab ID:	
Preservation: Yes □	Temperature:
Initials:	

North Dakota Department of Health
Sample Identification Record
Division of Laboratory Services–Chemistry
Telephone: 701.328.6140
Fax: 701.328.6280

Surface Water Sample Identification Code R (Water samples)
Samples received without this sheet or without all necessary sections fully completed will be rejected and not analyzed.

Sample Collection/Billing Information

Account #	**Project Code:**	**Project Description:**
Customer (Name, Address, Phone): SWQMP, Division of Water Quality, Gold Seal Center, 4th Floor		

Date Collected:	**Time Collected:**	**Matrix:** Water	**Site ID:**
Site Description:			
Alternate ID:	**Collected By:**		
County Number:	**County Name:**		
Comment:			
Comment:			

Field Information/Measurements

Sample Collection Method (Circle One): Grab DI* DWI** 0-2 meter column	**Depth:**	**Units:**	**Discharge:**	**Stage:**

Conductivity:	**pH:**	**Temp:**	**Dissolved O_2**	**Turbidity:**	
Comment:					

Analysis Requested

□ 5) SW-Major Cations/Anions	□ 74) SW-PAHs	□ 33120) SW-E. coli	
□ 7) SW-Trace Metals	□ 84) SW-PCBs	□ SW-TOC	
□ 21) SW-Carbamates	□ 105) SW-Chlorophyll-a & b Volume Filtered:_____mL	□ SW-DOC	
□ 23) SW-Acid Herbicides	□ 118) SW-TSS	□ SW-C-BOD-5day	
□ 25) SW-Base/Neut. Pest	□ 144) SW-Trace Metals-dissolved	Other:	
□ 30) SW-Nutrients, Complete	□ 160) SW-Nutrients, Complete-dis		
□ 50) SW-Nutrients, Total P-dis.	□ 33080) SW-Fecal coliform bacteria		

Figure 7.09.2 Sample Identification/Custody form. * Depth Integrated ** Depth/Width Integrated

Project Code Project Description

Sample ID Site Description

Analysis: (DC Code) SW-Analyte Group
Container: Preservative:
Date:_ /_ /_ Time:_ :_ Depth:__
Sampler_____

Project Code Project Description

389990 Field Blank Samples

Analysis: (DC Code) SW-Analyte Group
Container: Preservative:
Date:_ /_ /_ Time:_ :_ Depth:__
Sampler_____

Project Code Project Description

389999 Duplicate Samples

Analysis: (DC Code) SW-Analyte Group
Container: Preservative:
Date:_ /_ /_ Time:_ :_ Depth:__
Sampler_____

Figure 7.09.3 SWQMP Water Chemistry Label, Water Chemistry Blank Label, and Water Chemistry Duplicate Label.